DOCUMENT RESUME

ED 476 762 SE 067 817

TITLE	Mapping Biodiversity.
INSTITUTION	World Wildlife Fund, Washington, DC.
REPORT NO	No-23
PUB DATE	2003-00-00
NOTE	24p.
PUB TYPE	Guides - Classroom - Teacher (052)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	Activity Units; *Biodiversity; *Biology; Lesson Plans; *Maps; Science Activities; Science Instruction; Secondary Education; Teaching Methods

ABSTRACT

This document features a lesson plan that examines how maps help scientists protect biodiversity and how plants and animals are adapted to specific ecoregions by comparing biome, ecoregion, and habitat. Samples of instruction and assessment are included. (KHR)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 476 762

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

J. Braus

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

23 Mapping Biodiversity

SUBJECTS

social studies (geography), science, art

SKILLS

gathering (reading comprehension), organizing (manipulating materials, mapping, matching), interpreting (relating), applying (proposing solutions, synthesizing), citizenship (working in a group)

FRAMEWORK LINKS

2, 3, 7, 12, 17, 21, 23, 25, 53, 56, 71

VOCABULARY

biome, **ecoregion, endemic,** *gap analysis, Geographic Information Systems (GIS),* **habitat, temperate rain forest, tropical dry forest, tropical rain forest**

TIME

Part I—*one to two sessions*
Part II—*one to two sessions, or homework if class time is limited*

MATERIALS

See "Before You Begin" Part I and Part II.

CONNECTIONS

For a look at more species from around the world, try "Endangered Species Gallery Walk" (pages 240–245), and explore the major causes of biodiversity loss with "The Case of the Florida Panther" (pages 246–251). To look at some of the other factors important in designing reserves, use "Space for Species" (pages 286–301).

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

SE067817

AT A GLANCE

Take part in mapping activities to explore the world's ecoregions and learn how experts make decisions about which natural areas to protect.

OBJECTIVES

Give several examples of how maps help scientists protect biodiversity. Compare the following terms: biome, ecoregion, and habitat. Give several examples of how plants and animals are adapted to specific ecoregions.

Conservation biologists know that if we want to protect species over the long term, we need to protect the places where species live. Sound simple? Maybe. But species protection is complicated work for biologists, social scientists, and planners. It's not enough to know the life cycle of one species. Experts need to understand the relationships between a species and its ecosystem, among different species in the same ecosystem, and among adjacent ecosystems. They also need to know how people affect and are affected by species and ecosystems. And they need to decide which areas are most important to protect.

None of this is easy. And beyond that lies the challenge of putting all available information together in a way that helps create effective conservation strategies in the short term and long term. The good news is that two of the most effective planning tools—maps and computers—have come a long way in the past decade.

In Part I of this activity, your students will learn more about how biologists survey and map critical ecoregions by taking a close look at World Wildlife Fund's Global 200 map of the world, which highlights more than 200 ecoregions that WWF believes represent the most important conservation priorities for the twenty-first century. By playing a mapping game with the Global 200 map, the students will learn more about the species, ecological processes, and landscapes that make these ecoregions so important. In Part II, they'll conduct their own gap analysis in an area they create. Depending on the resources you have in your school or community, you can introduce them to Geographic Information Systems (GIS) technology and give them a chance to see how it can be used locally to study and plan for the protection of biodiversity.

BEST COPY AVAILABLE

Before You Begin • Part I

Make one one-sided copy of each of the "Ecoregion Species Cards." (pages 123–137 in the Student Book). Make 20 copies of "Ecoregion at-a-Glance" (page 121 in the Student Book), which is one for each ecoregion covered in this activity. Make seven copies of the "Secret Message Cards" (page 138 in the Student Book). Gather scissors, clear tape or glue, string, and world maps or atlases (optional).

What to Do • Part I

THE GLOBAL 200

WWF's Global 200 map highlights 233 of the richest, most diverse, and most threatened terrestrial, freshwater, and marine ecoregions. Ecoregions are broad habitat types that are tied to specific geographic regions. For example, the *Namib and Karoo Deserts and Shrublands* is an ecoregion in western Africa. And the *Everglades Flooded Grasslands* is an ecoregion in the southeast corner of the United States. The ecoregions highlighted on the map include a broad representation of the world's biodiversity and provide a blueprint for WWF's conservation priorities in the next century. (See the box on page 256 for more about ecoregions, ecosystems, habitats, and major habitat types.)

In creating this map WWF and its partners first looked at which regions support the greatest total species diversity. Areas such as tropical rain forests in South America and the barrier reefs of Costa Rica, Belize, and Australia support an enormous number of species. In fact, tropical rain forests as a whole occupy less than seven percent of the Earth's total land mass but may contain more than half the species on the planet. (See page 264 for more about how biodiversity is distributed on the planet.)

But numbers of species are just one measure of biodiversity. Scientists also gave a high priority to areas that house *endemic* species—those found nowhere else on Earth. Examples of endemic species include the lemurs of Madagascar, the snail kites of the Florida Everglades, and the Cape sunbirds of South Africa.

The scientists working on WWF's map also assessed several other factors, including areas that are essential to migrations, breeding, and other natural phenomena, those areas that are facing severe threats, and those areas that are most likely to be protected.

Finally, using GIS layering, the scientists created a finished map that conservationists can use to make decisions about how to protect biodiversity worldwide. In this part of the activity, students play a game and use the map to learn more about some of the amazing plants and animals that live in different ecoregions around the world.

1. Discuss ways to protect species.
Ask your students if they have any ideas about what scientists do to protect threatened plants and animals. After students give a few suggestions (e.g., enforcing the Endangered Species Act, running captive breeding programs, protecting wildlife habitats as parks and wildlife refuges), explain that most scientists today believe that the most effective way to protect species is to protect the places where they live. That means protecting forests, lakes, deserts, coasts, and other types of habitat so that the greatest number of species and ecological processes are protected.

Show your students the Global 200 map you've posted (or the one on page 122 in the Student Book) and explain that it shows some of the most important and threatened ecoregions around the world. (See introduction at the left for more about the process.) Describe ecoregions according to the information in the box "Talk the Talk" (page 256). You might want to give examples to the students to explain the difference between major habitat types, or biomes, and ecoregions. Explain that in this activity they'll find out more about these amazing—and in many cases, threatened—places.

A Powerful Conservation Tool

Maps are a great way to make complex data easier to understand and analyze. Conservation biologists use maps to show land forms, fluctuations in human populations, patterns of ecological change, species' ranges, and many other ecological phenomena. And in the last two decades maps have become even more valuable thanks to a computer technology called Geographic Information Systems, or GIS.

With GIS, scientists make one map on the computer for each batch of data they collect. For example, they can create a map showing all of the bodies of water in an area, the location of every nesting site of a rare bird species, or the location of every surrounding village. Then GIS allows the scientists to combine the different map layers into a single image so they can analyze how the different pieces of data relate to one another.

One of the most important applications of GIS for conservation biologists is something called gap analysis. After scientists have identified areas especially high in biodiversity, or areas where species or ecological processes are highly threatened, they have to decide where to focus their protection efforts. Using GIS, they can determine which areas are already protected and where there are gaps in protection.

World Wildlife Fund

2. Pass out "Ecoregion Species Cards."
In this activity, there are 60 "Ecoregion Species Cards," which represent 20 ecoregions. This demonstration will be done in rounds to cover all 60 species. To determine how many ecoregions will be explored in each round, count the number of students in your group and divide by three. The number you come up with is the number of ecoregions your group will cover in each round of this activity. If you have 30 students, for example, you will select the ecoregion species cards for 10 ecoregions. Then scramble and pass out the 30 cards (there are 3 species for each ecoregion)—1 to each student. (To learn which species live in which ecoregions, see pages 260–261.)

Explain to the class that each of the cards depicts one species of three that live together in a specific ecoregion. The students' goal is to find the other two members of their ecoregion using the information on their card. Clues as to the identity of one or both of the ecoregion partners are given within each species' description. Once the students have located their two teammates they should identify the ecoregion that all three organisms belong to.

Each species card includes information on the natural history of the animal or plant along with its common name and scientific name. Explain to the students that scientific names are used to distinguish one species from another, and that no two species have the same scientific name. The first word of the scientific name tells which genus the animal or plant belongs to. The second word is the species name. In the "Ecoregion Species Cards," some of the plants and animals represented include more than one species. In these cases, instead of stating a species name, we've listed the genus followed by "spp.," indicating that the animal or plant represents numerous species. (For more information on scientific names, see page 110 in "Sizing Up Species.")

3. Match organisms with ecoregions.
After the students have located their partners, ask them to tape their three species cards to a piece of paper and write the name of their ecoregion on the paper. Ask them to post their paper next to the map and link the ecoregion to its location on the map with a length of string. Explain that the names of the ecoregions are listed by habitat type at the bottom of the map. Each habitat type has a different color that corresponds to shaded areas on the map.

As each group finishes (or if others are waiting for their turn), hand the students an "Ecoregion at-a-Glance" worksheet (on page 121 in the Student Book) to fill out on their own. When all the groups have finished posting their species cards, pass out the next round of cards and repeat the process. If necessary, run a third round to cover all 20 ecoregions.

4. Give presentations.

When all of the ecoregion cards have been posted, have the students do a brief presentation on their ecoregion(s) to the rest of the class. To expedite this process, you might have a spokesperson from each group come to the front of the room, point out and name the ecoregion, and give a few interesting bits of information about it. The "Ecoregion at-a-Glance" worksheet should help the students pick out and organize the information for their presentation.

5. Decipher secret messages.

Have the students form seven groups. Distribute copies of the secret message and bonus question cards to each group. Explain that, for some ecoregions, letters in the text of the species cards are boldfaced and underlined. To find the answers to the secret message questions, the students must first locate these letters in each ecoregion mentioned in their secret message cards. Then by unscrambling the letters they'll come up with the answer. The bonus question uses all the boldfaced and underlined letters on the species cards.

For example, the first secret message card poses the question: "The island of Kauai (part of the Pacific Ocean's Hawaiian Island chain), has more of this than any other place on earth." To find the answer, students will need to search the "Ecoregion Species Cards" from the Namib Desert, the Scandanavian Alpine Tundra, the Klamath-Siskiyou Coniferous Forests, and the Southwest Australian Shrublands and Woodlands for boldfaced, underlined letters. The letters found on these cards are *a, i, n,* and *r* and these letters can be rearranged to find the answer to the question: "rain." (For answers see pages 260–261.)

6. Discuss the importance of ecoregional mapping.

After students have completed the mapping activity, review the purpose of the map and why it's a useful conservation tool. Ask the group to think about how this type of map is different from other maps they've seen. (The concept of using ecoregions as the basis for conservation planning is fairly new.) Today many scientists believe that it's more effective to conserve ecoregions than to focus on protecting individual species or small patches of habitat, and that by conserving the diversity and richness of ecoregions we can protect more species and important ecological processes.

Explain that WWF and many other conservation organizations are working together to protect biodiversity by using an ecoregional approach. They're looking at protecting marine and freshwater ecoregions as well as terrestrial ecoregions. You can ask the students to think about the types of threats that these areas are facing and how maps like this can help the public better understand conservation issues. *(Many ecoregions are threatened by pollution, global climate change, development from housing, road building, farming, and other human activities, as well as an overall lack of habitat protection. Maps like the Global 200 show that there are important ecoregions all around the world and that many are threatened and vulnerable. They also show that marine, freshwater, and terrestrial ecoregions are all important and that many areas are in trouble.)*

Giant Panda
Wild giant pandas live only in the Central/Southwest China Temperate Forests. Among their favorite foods are the stems and leaves of fountain bamboo.
Windows on the Wild
BIODIVERSITY BASICS

sample ecoregion card

Windows on the Wild: Biodiversity Basics

BEST COPY AVAILABLE

TALK THE TALK

Definitions of Ecoregions, Biomes, and Habitats

Before starting the game in Part I, you might want to help your students learn the "lingo" that conservation biologists use to describe natural areas. The two easiest-to-confuse terms are **ecoregion** *and* **biome** *(or major habitat type). But many people also get confused when they try to explain the difference between habitats and ecoregions. Here are definitions and examples of all three words.*

Biome (Major Habitat Type)

Biomes, which are also called major habitat types, are large areas characterized by the types of plants that dominate the area. For example, temperate coniferous forests, and savannas and grasslands are biomes. Coniferous forests are dominated by conifers (trees with needles), and savannas and grasslands are dominated by grasses and small shrubs.

Ecoregion

Ecoregions are geographically distinct areas that are characterized by the types of communities that live there. Areas that make up ecoregions have similar plant and animal species and similar environmental conditions such as climate, terrain, altitude, and soil type. In the example provided below, the Klamath-Siskiyou Coniferous Forest in the Pacific Northwest is one ecoregion in the temperate coniferous forest biome. But it has a certain set of plants and animals and certain environmental conditions that separate it from other temperate coniferous forest ecoregions in other parts of the world. The tallgrass prairie of the Midwest is an example of an ecoregion in the temperate grasslands and savannas. It has a certain set of plants, animals, and environmental conditions that make it unique within the grasslands biome.

Habitat

Habitat refers to a place that provides whatever a species needs to survive, such as food, water, and living space. "Black bear habitat" and "sagebrush habitat" mean places that support those specific organisms. There are many different types of habitats within ecoregions and biomes.

Note: *See the background information on page 28 for more on these and other ecological terms.*

Biome (Major Habitat Type)
Temperate Coniferous Forest

Ecoregion
Klamath-Siskiyou Coniferous Forest

World Wildlife Fund

ECOREGION AT-A-GLANCE

Name of Ecoregion:

Location:

Three or more species that live in this ecoregion:

1. _____
2. _____
3. _____

_____

Three interesting facts about this ecoregion or these species:

1. _____
2. _____
3. _____

THE GLOBAL 200 MAP

This map highlights more than 200 of the richest, rarest, and most unique natural areas on the planet. From the windswept tundra of Alaska's North Slope to the warm tropical forests of the Congo Basin, these bio-rich areas are teeming with life.

Legend

- Terrestrial Ecoregions
- Marine Ecoregions
- Freshwater Ecoregions

WWF

BEST COPY AVAILABLE

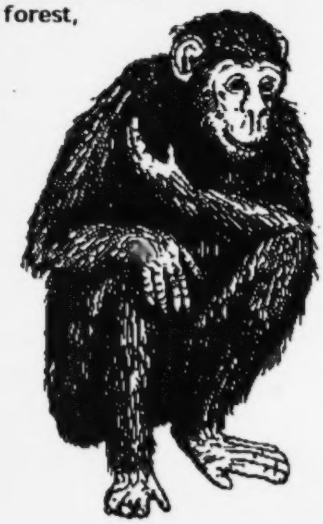
Okapi
[o-KA-pee] (Okapia johnstoni)

This hoofed mammal is related to giraffes. But it's so elusive that it wasn't named by scientists until the early 1900s. The okapi's front half is rich brown, and its rump and hind legs are striped like a zebra. This coloring helps it stay camouflaged in the Southern Congo Basin Forests of central Africa.

Windows on the Wild
BIODIVERSITY BASICS

Bonobo
[bow-NO-bow] (Pan paniscus)

Bonobos, or "pygmy chimps," live deep in the forest, alongside such animals as okapis and forest elephants.



Windows on the Wild
BIODIVERSITY BASICS

Salongo Monkey
[sa-LAWN-go] (Cercopithecus salongo)

This Old World monkey lives in the thicket of the moist broadleaf forest of central Africa. These monkeys spend a majority of their time on the ground foraging for fruits, leaves, and plant shoots.

Windows on the Wild
BIODIVERSITY BASICS

Giant Baobab
[BAY-o-bab] (Adansonia grandidieri)

If you walked in the Madagascar Dry Forests, you'd be sure to see these tall, swollen trees. Like the rest of the plants in this region, baobabs have to survive a long and hot dry season. One way they do this is by having huge water-filled trunks, earning them the name of "bottle trees." Local people may tap a hole in the trunk of a baobab to obtain water for themselves or their livestock.

Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

Sicklebilled Vanga

[VAN-ga] (Falculea palliata)

This beautiful black and white bird uses its long, curved bill to hook insects out of their holes. You might see one perched on the trunk of a giant baobab tree- searching for a juicy snack beneath a piece of bark.

Windows on the Wild
BIODIVERSITY BASICS

Panther Chameleon

[ka-MEE-lee-on] (Chameleo pardalis)

Underneath giant baobabs grow scrubby bushes and trees where these chameleons hunt for insects. Panther chameleons are patient and observant hunters, with eyes that can swing fully in their sockets and look in two directions at once. As one of these chameleons slowly approaches its prey, it sways back and forth like a piece of vegetation moving in the wind. When the lizard is close enough, its sticky-tipped tongue flashes out and nabs the meal, bringing it back to the chameleon's mouth in a fraction of a second.

Windows on the Wild
BIODIVERSITY BASICS

Wild Maize

[MAZE] (Zea diploperennis)

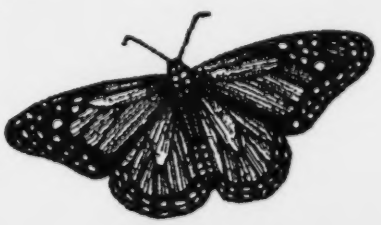
Monarch butterflies and imperial woodpeckers share their forests with a plant called wild maize. This wild grass is closely related to one of the world's most important food crops: corn. That means that genes from wild maize may be used in the future to protect domesticated corn from diseases and to help it adapt more easily to harsh environmental conditions.

Windows on the Wild
BIODIVERSITY BASICS

Monarch Butterfly

[MAHN-arch] (Danaus plexippus)

Maybe you've heard of birds flying south for winter, but what about insects? In the fall, thousands of these brilliant black and orange insects fly from all parts of the eastern United States and Canada to the Mexican Pine-Oak Forests. Some monarchs travel as many as 3,000 miles! Then they spend the winter together in just a few isolated groves of trees.



Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

Imperial Woodpecker
(Campephilus imperialis)

If you are very lucky, you may see this extremely threatened woodpecker. First you need to go to the pine trees where most monarch butterflies in North America spend their winters. Then look high in the branches where the imperial woodpecker often perches.

Windows on the Wild
BIODIVERSITY BASICS

Cobra Lily
(Darlingtonia californica)

In open bogs surrounded by bushes of western azaleas, you may find these plants. They form large tubes that look like a giant hooded cobra with a forked tongue. Insects that crawl inside the hood to explore are trapped by bristles and fall into a pool of liquid where they are digested by the plant.

Windows on the Wild
BIODIVERSITY BASICS

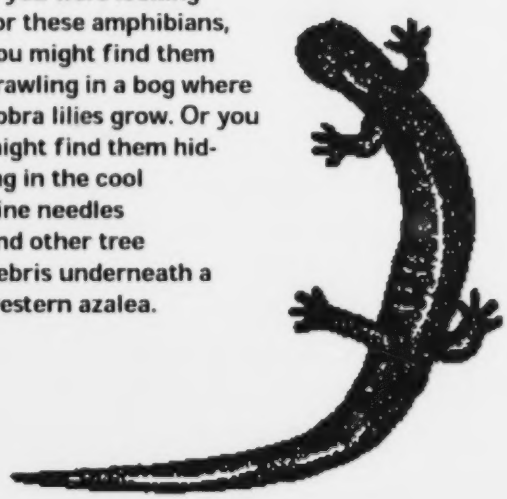
Western Azalea
[a-ZAY-lee-uh] (Rhododendron occidentale)

Delicate pink flowers decorate the western azalea. This plant grows in the shade of the Klamath-Siskiyou Coniferous Forests, which have the highest diversity of needle-leafed trees in the world. While walking in these forests, you might see the low-hanging branches of the Brewer's spruce tree or notice the sweet smell of the ponderosa pine.

Windows on the Wild
BIODIVERSITY BASICS

Siskiyou Mountains Salamander
[SIS-ka-you] (Plethodon stormi)

If you were looking for these amphibians, you might find them crawling in a bog where cobra lilies grow. Or you might find them hiding in the cool pine needles and other tree debris underneath a western azalea.



Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

Fountain Bamboo
[bam-BOO] (Fargesia nitida)

The fountain bamboo is a giant grass that grows in mountain forests. Some groves of fountain bamboo bloom only once every 100 years. And after they flower, they quickly die. If this happens over a large area, giant pandas and other animals that eat bamboo may have to travel great distances to find enough food to survive.

Windows on the Wild
BIODIVERSITY BASICS

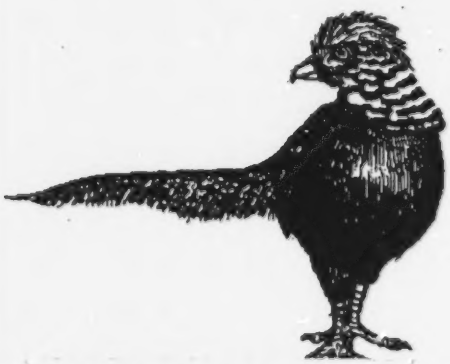
Giant Panda
(Ailuropoda melanoleuca)

Wild giant pandas live only in the Central/Southwest China Temperate Forests. Among their favorite foods are the stems and leaves of fountain bamboo.

Windows on the Wild
BIODIVERSITY BASICS

Golden Pheasant
[FEZ-ant] (Chrysolophus pictus)

The fruits and seeds of various plants are the food of the golden pheasant. This rare bird lives in the same mixed forests where you might find a giant panda.



Windows on the Wild
BIODIVERSITY BASICS

Wolverine
[WOOL-ver-een] (Gulo gulo)

These creatures are small but fierce! They hunt small mammals in the cold forests of Siberian spruce that cover northern Asia.

Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

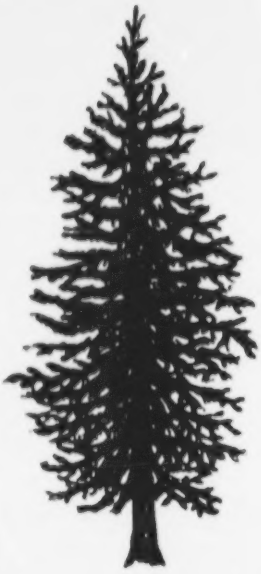
Long-Eared Owl
(Asio otus)

During the day, long-eared owls roost in the high branches of trees such as Siberian spruce. Their patchy brown color helps them blend in with their surroundings. At night, they hunt for rats, mice, rabbits, and other small mammals that share their cold forest home.

Windows on the Wild
BIODIVERSITY BASICS

Siberian Spruce
(Picea obovata)

The Siberian spruce is one of the common trees found in the largest unbroken wilderness in the world: the Central and Eastern Siberian Boreal Forests and Taiga.



Windows on the Wild
BIODIVERSITY BASICS

Norway Lemming
(Lemmus lemmus)

During the long, dark winter of the Arctic region, lemmings make tunnels under the snow as they search for grasses, shrubs, mosses, and other food. But every few years, these rodents experience a population explosion, and large groups of them move above ground into open fields and valleys, which they share with large herds of reindeer. Contrary to popular belief, the lemmings do not migrate to the sea and commit suicide, although most of those that wander into the open are eaten by predators.

Windows on the Wild
BIODIVERSITY BASICS

Reindeer
(Rangifer tarandus)

The reindeer (or caribou) is the only deer in which both sexes have antlers. During the long days of summer, they feed on grass and other plants in the tundra. In the winter, they must scrape away snow to expose dry lichens, which can endure in the intense cold. In the Scandinavian Alpine Tundra and Taiga, local people such as the Sami depend on reindeer for meat, milk, and clothing.

Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

Arctic Fox
(Alopex lagopus)

The arctic fox has fur-covered feet and small, rounded ears to reduce heat loss in the cold tundra. Arctic foxes don't hibernate in winter. To track down a meal when times are lean, they may listen for the sounds of lemmings and other small mammals scrambling under the snow.

Windows on the Wild
BIODIVERSITY BASICS

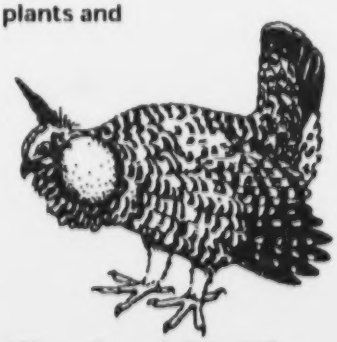
Prairie Dog-Tooth Violet
(Erythronium mesochoreum)

The small white flowers of the prairie dog-tooth violet are among the first signs of spring in the vast Tallgrass Prairies of the central United States.

Windows on the Wild
BIODIVERSITY BASICS

Greater Prairie Chicken
(Tympanuchus cupido)

As you wade through a sea of tall grass, you may hear the booming call of the male greater prairie chicken. The male birds perform spectacular courtship displays-inflating large pouches on their necks, stamping their feet, and fanning their tail feathers to attract females. They share their home with a variety of plants and animals, from the tiny prairie dog-tooth violet to the enormous bison.



Windows on the Wild
BIODIVERSITY BASICS

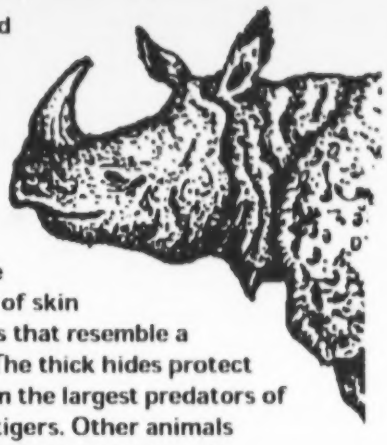
American Bison
(Bison bison)

Just 200 years ago there were millions of bison roaming the grasslands of North America. By the beginning of the 20th century, they were almost extinct. Now bison are increasing, thanks to protection efforts. But most of their vast grassland home has become agricultural land. Greater prairie chickens, prairie dogs, wolves, and rattlesnakes are a few of the animals that live side by side with the bison in the wild.

Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

One-Horned Rhinoceros
(Rhinoceros unicornis)



The one-horned rhinoceros grazes in fields of grass that grows over 20 feet tall! The rhinos' hides are made of thick plates of skin with deep folds that resemble a suit of armor. The thick hides protect the rhinos from the largest predators of their habitat- tigers. Other animals that share these grasslands include Asian elephants, chital, and Indian bison.

Windows on the Wild
BIODIVERSITY BASICS

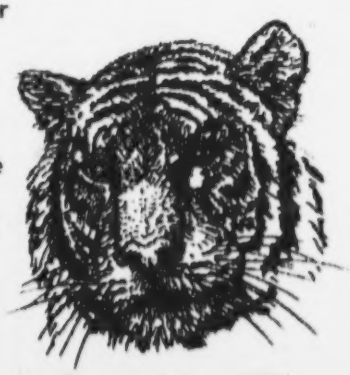
Chital
(CHEED-al) (Axis axis)

This deer has a rich brown coat speckled with white spots, which help to camouflage it in the high grass of the Terai-Duar Savannas and Grasslands of central Asia. It has an acute sense of hearing and will dash away at the slightest hint that its main predator, the tiger, is nearby.

Windows on the Wild
BIODIVERSITY BASICS

Tiger
(Panthera tigris)

Tiger stripes are more than pretty decoration. The stripes help tigers blend in with light and shadows as they stalk wary prey, such as chital, in the high grass. Unfortunately, people have hunted these rare cats to near extinction because of their handsome coats and because many other parts of their bodies are believed to have medicinal value.



Windows on the Wild
BIODIVERSITY BASICS

Snail Kite
(Rhostrhamus sociabilis)

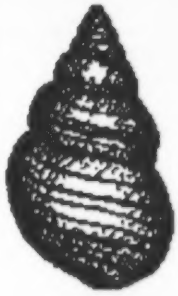
In order to make room for houses, shopping centers, and farms, people have drained the water from the snail kite's habitat. Unfortunately, this change has drastically reduced populations of the bird's main food source: apple snails.

Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

Florida Tree Snail
(Liguus fasciatus)

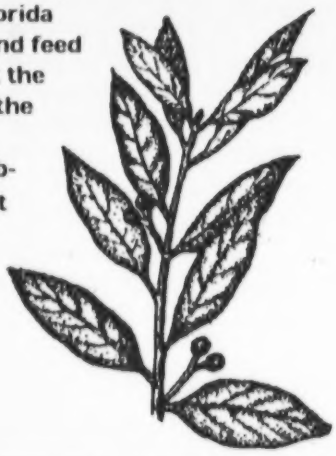
Years ago, a visitor to the Everglades Flooded Grasslands might have found hundreds, or even thousands, of shells belonging to the Florida tree snail. But as the Everglades have been drained for housing developments and agriculture, Florida tree snails and many other kinds of snails (such as the apple snail) are becoming rare. And now the animals that depend on the snails for food are in danger of becoming extinct.



Windows on the Wild
BIODIVERSITY BASICS

Red Bay
(Persea borbonia)

Clumps of red bay trees rise like islands in the sea of sawgrass that covers their flooded homes. Almost two dozen different species of tree snails, including the Florida tree snail, live and feed on red bays. But the snails don't eat the trees' leaves. Instead, they nibble on algae that grow on the red bays' bark.



Windows on the Wild
BIODIVERSITY BASICS

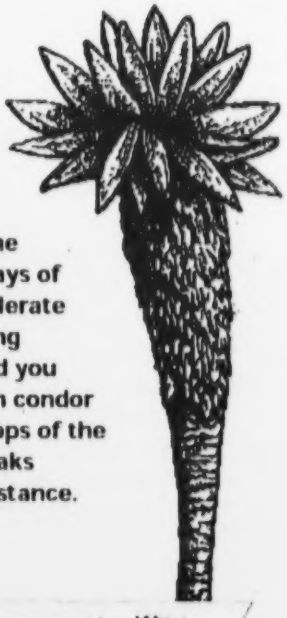
Andean Condor
[AN-dee-an KON-door] (Vultur gryphus)

These condors are the largest flying birds on Earth- soaring at altitudes of up to 20,000 feet. They feast on the dead carcasses of vicuña, llama, alpaca, and other large grazing animals that live in the cold mountain heights.

Windows on the Wild
BIODIVERSITY BASICS

Frailejón
[Fray-eelay-HONE] (Espeletia spp.)

The fuzzy gray leaves of the frailejón are perfectly adapted to the high altitudes of the North Andean Paramo. The leaves resist the harsh ultraviolet rays of the sun and can tolerate the region's freezing nights. Look up and you may see an Andean condor soaring near the tops of the glacier-covered peaks that loom in the distance.

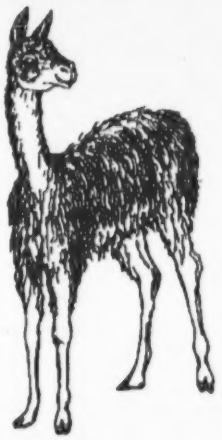


Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

Vicuña
[vi-KOON-ya] (Vicugna vicugna)

The silky cinnamon-colored fur of the vicuña was so highly valued in ancient times that only the royal people of the Inca (an empire that flourished in the 1500s) were allowed to use it. These animals roam the high mountains, wandering among the fuzzy frailejón and other plants. The small vicuña is related to domesticated llamas and alpacas, animals important to local people for their meat and wool.



Windows on the Wild
BIODIVERSITY BASICS

Welwitschia Plant
[wel-WIT-shee-a] (Welwitschia mirabilis)

This unusual plant produces only two leaves, which can grow for the entire life of the plant. And that can be more than 1,500 years! The welwitschia plant grows in the extreme conditions of the Namib and Karoo Deserts and Shrublands of southern Africa, where it may not rain for more than five years in a row.

Windows on the Wild
BIODIVERSITY BASICS

Darkling Beetle
(Onymacris unguicularis)

These beetles feed on dead animal and plant material that collects in their rugged desert home. Though there is almost no rain, these beetles have developed ways to obtain water from the fog that commonly settles around the dunes. Some tip their abdomens upright so that the condensation on their backs runs into their mouths. Others dig trenches to collect fog water on the ground. During the heat of the day, these beetles may seek shelter underneath the sand or in the shade of a welwitschia plant.

Windows on the Wild
BIODIVERSITY BASICS

Sand-Diving Lizard
(Aporosaura anchietae)

Sand-diving lizards hunt for darkling beetles, spiders, scorpions, and other small animals that scuttle across the desert. When things get hot, the lizards dive under the sand or seek out the shade of plants, such as the welwitschia. In doing so, they help reduce water loss from their bodies.

Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

Numbat
[NUM-bat] (Myrmecobius fasciatus)

With its elegant striped coat, the numbat is one of the most beautiful marsupials in the world. Unlike most marsupials, numbats are active during the day. They use their thick claws to open termite nests, lapping up the insects with their long tongues. Some of their main predators in the wild are hunting birds such as little eagles and brown goshawks.

Windows on the Wild
BIODIVERSITY BASICS

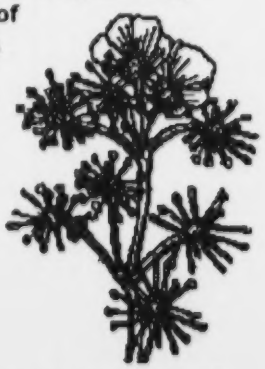
Brown Goshawk
[GOSS-hawk] (Accipiter fasciatus)

The brown goshawk makes its home in the Southwest Australian Shrublands and Woodlands. There the bird uses its sharp eyes to hunt down honey possums, numbats, and other small mammals.

Windows on the Wild
BIODIVERSITY BASICS

Drosera Sundew
[DROSS-er-a] (Drosera menziesii)

As numbats nab termites with their long tongues, meat-eating sundew plants are using their own sticky trick to catch a meal. Passing insects are attracted to the pink flowers on these lovely plants. But when they land on the leaves, they get stuck! The plant's dew is a super sticky substance. The globs of "glue" are on the ends of hairs that slowly curl around the insect and digest it. In the process, the plant absorbs valuable nutrients.



Windows on the Wild
BIODIVERSITY BASICS

Platypus
[PLAT-i-puss] (Ornithorhynchus anatinus)

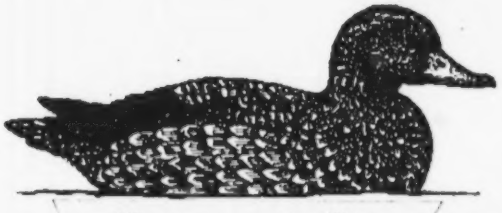
It has a beak and webbed feet, but it isn't a bird! The platypus is actually a "duck-billed," egg-laying mammal that lives in Eastern Australian Rivers and Streams. The platypus pokes around the bottom of the river with its flexible bill to find the small animals it eats. But it keeps its eyes, ears, and nostrils closed- using only touch receptors to find its way under water.

Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

Freckled Duck
(Stictonetta naevosa)

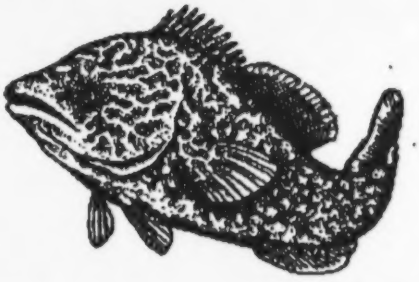
During the day, the rare freckled duck hides out in dense vegetation to avoid the Murray cod and other predators. Only at night does it venture out into shallow waters to feed on plankton and algae. With its head below the surface, it may encounter other water creatures, such as the platypus, that share the rivers it calls home.



Windows on the Wild
BIODIVERSITY BASICS

Murray Cod
(Maccullochella peeli)

Swimming in the same waters as the platypus is this enormous and incredibly aggressive fish. Weighing about 255 pounds, the Murray cod preys on almost anything in its path, including the rare freckled duck, other waterfowl, and rats.



Windows on the Wild
BIODIVERSITY BASICS

Amazon Dolphin
(Inia geoffrensis)

This freshwater dolphin spends its days avoiding fishing nets and looking for food. It feeds on fish that eat fruit that drops into the water from surrounding trees. Because of its pink color, this dolphin may be the source of many legends in the Amazon that tell of an animal that can change from human to dolphin.

Windows on the Wild
BIODIVERSITY BASICS

Arawana Fish
[arr-a-WA-na] (Osteoglossum bicirrhosum)

Arawanas live in the Varzea and Igapó Freshwater Ecosystem and can grow to be about three feet long. They have been known to jump several feet out of the water to catch small birds for food! They also feed on insects that land on the surface of the water. Arawanas have a rough tongue covered with sharp, tooth-like projections that trap food up against the roof of their mouths.

Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

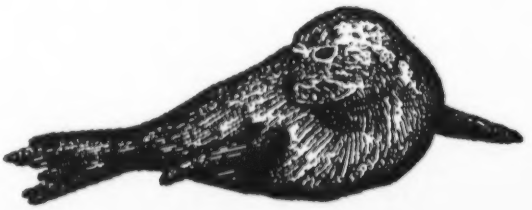
Black Caiman
[KAY-man] (Melanosuchus niger)

If you visit the Amazon, watch out for a head sticking out of the water with yellow or white bands on the lower jaw. Black caimans are crocodilians that feed on fish that swim in the freshwater rivers of the Amazon Basin. But as they get older, they may come ashore to feed on rodents, domestic animals, and sometimes even humans.

Windows on the Wild
BIODIVERSITY BASICS

Nerpa
[NER-pa](Phoca sibirica)

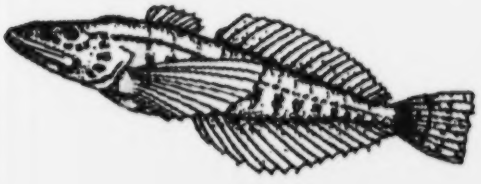
It is a mystery how this seal, known as the nerpa, made its way to Lake Baikal- which is hundreds of miles from any sea or ocean! The only freshwater seal in the world, the nerpa's warm pelts and fat have made it a favorite of hunters for thousands of years.



Windows on the Wild
BIODIVERSITY BASICS

Golomyanka
[go-low-mee-ON-ka](Comephorus baicalensis)

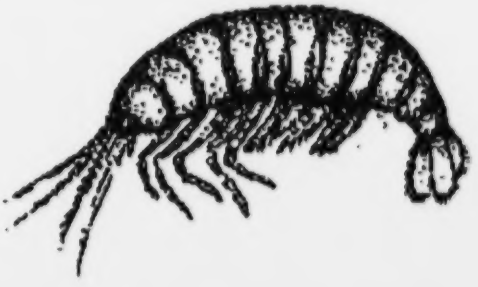
This fish, known as the golomyanka, can be found swimming in the icy waters of Lake Baikal. This transparent fish makes a great meal for hungry nerpa seals. The golomyanka also shares its harsh lake home with tiny filter-feeding crayfish.



Windows on the Wild
BIODIVERSITY BASICS

Gammarid Shrimp
[ga-MARR-id](Eulimnogammarus spp.)

Known as caretakers of their icy lake home, these tiny crayfish devour everything that threatens to pollute their cold, watery habitat, including dead fish and insects. They ensure that their golomyanka and nerpa neighbors have a clean home.



Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

White Stork
(Ciconia ciconia)

This long-necked wading bird struts its stuff through the shallow wetland waters of the Danube River Delta. Not afraid of human hustle and bustle, white storks often nest in the cultivated countryside of eastern Europe.

Windows on the Wild
BIODIVERSITY BASICS

Black Stork
(Ciconia nigra)

Unlike its white counterpart, this wetland stork avoids human activity by nesting away from the populated European countryside. Wading with its long bill partially open beneath the water, it feeds early- before the hoarse voice of the corncrake is heard across the delta.

Windows on the Wild
BIODIVERSITY BASICS

Corncrake
(Crex crex)

"Creck creck" is the sound of this shy wetland bird- no doubt the reason for its scientific name. The rasping cry is usually heard only after dark or at dawn. The corncrake shares its watery home with many other birds, including two species of stork.

Windows on the Wild
BIODIVERSITY BASICS

Whitetip Reef Shark
(Triaenodon obesus)

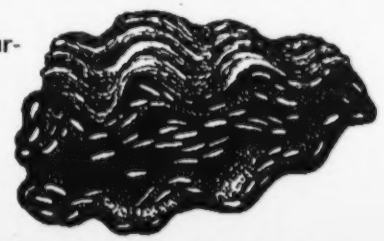
This timid shark lurks in caves or beneath rocky reef shelves. It lives in the warm and salty Red Sea Marine Ecosystems- a home to unique coral species. The shark gets its name from the white outline on the tips of its fins.

Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

Giant Clam
(Tridacna gigas)

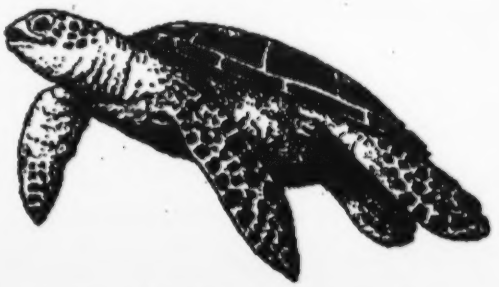
Like its white-tipped neighbor and the sea in which it lives, the giant clam is known for its coloring. Sparkling blues and greens on the clam's mantle (the membrane between the body and the shell) actually result from colorful algae that live in the exposed tissue. These huge mollusks can sometimes live for 50 years and grow to be several hundred pounds. They share the reef waters with green turtles.



Windows on the Wild
BIODIVERSITY BASICS

Green Turtle
(Chelonia mydas)

Grazing on sea grasses and algae of the reef, green turtles are known as the cattle of the warm seas. They normally live in reef waters alongside whitetip reef sharks and giant clams. But they may also migrate through hundreds of miles of open ocean to lay their eggs.



Windows on the Wild
BIODIVERSITY BASICS

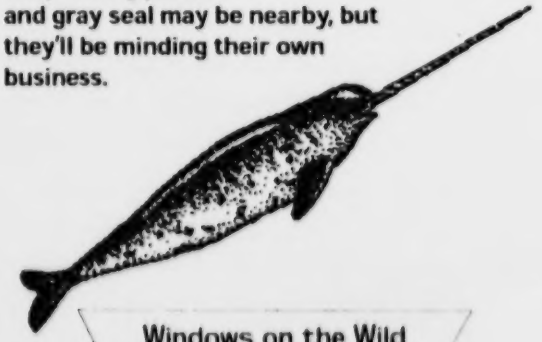
Puffin
(Fratercula arctica)

Known as the "sea parrot," this unusual bird uses its wings to power its penguin-like body through the waters of Icelandic and Celtic Marine Ecosystems. As they dive down to 150 feet, these puffins use their feet to steer. They can carry as many as 28 small fish in their beaks at once!

Windows on the Wild
BIODIVERSITY BASICS

Narwhal
(NAR-wall) (Monodon monoceros)

When sailors in the 1700s came home carrying samples of the narwhal's spiraling tusk, people thought the tusks were proof that unicorns existed. A narwhal's tusk is strange, but it's really nothing more than a modified tooth. Male narwhals may use their tusks as a weapon in their fights for female attention. The deep-diving puffin and gray seal may be nearby, but they'll be minding their own business.

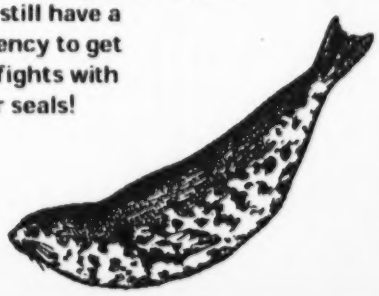


Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

Gray Seal
(Halichoerus grypus)

Gray and brown fur helps keep these seals warm in their icy home waters. They may snack on some of the same fish that puffins in the area eat. Large groups of seals may gather on secluded beaches, but individuals keep their distance. They don't have a weapon anything like their narwhal neighbors do, but they still have a tendency to get into fights with other seals!



Windows on the Wild

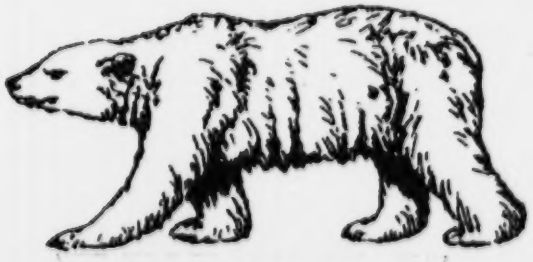
Walrus
(Odobenus rosmarus)

The polar region around the Bering and Beaufort Seas is home to herds of these highly social creatures. Walruses have long tusks that are used in dominance displays and sometimes as weapons. Between the tusks is a snout full of sensitive whiskers that help the walrus locate a meal in murky waters.

Windows on the Wild
BIODIVERSITY BASICS

Polar Bear
(Ursus maritimus)

Lying on their backs with their feet in the air, these powerful carnivores often nap on polar ice after a hunt. Polar bears aren't picky eaters- if there are no live seals in the area, the carcass of a bowhead whale or a walrus will do for dinner!



Windows on the Wild
BIODIVERSITY BASICS

Bowhead Whale
[BOE-head](Balaena mysticetus)

The heads of these whales make up one-third of their total length. And their arching jaws give them their "bowed" shape. Bowhead whales were at one time endangered because of commercial whaling, and their numbers remain low. Still, polar bears and walruses may see a female bowhead and her calf swimming offshore, or they may encounter a three-ton carcass washed up on the beach.

Windows on the Wild
BIODIVERSITY BASICS

BEST COPY AVAILABLE

SECRET MESSAGE CARDS

The island of Kauai (part of the Pacific Ocean's Hawaiian Island chain) has more of this than any other place on Earth.

____ ____ ____ ____

To find the answer, look in the Namib Desert, the Scandinavian Alpine Tundra, the Klamath-Siskiyou Coniferous Forests, and the Southwest Australian Shrublands and Woodlands.

This phenomenon is created by the gravitational pull of the sun and moon on planet Earth and is an important force that constantly changes the shape of the land's surface.

____ ____ ____ ____

To find the answer, go to the Mexican Pine-Oak Forests, the Central/Southwest China Temperate Forests, the Klamath-Siskiyou Coniferous Forests, and the Central and Eastern Siberian Boreal Forests.

In the deciduous forests of the eastern United States, the elimination of large predators and the increase of edge habitat has led to a dramatic increase in the population of these animals.

____ ____ ____ ____

To find the answer, look in the Madagascar Dry Forests, the Tallgrass Prairies of the United States, the Mexican Pine-Oak Forests, and the Central and Eastern Siberian Boreal Forests.

In the summer, you may find one of these normally seafaring birds hundreds of miles from the ocean, breeding in vast colonies in places such as the high plateaus of Tibet in central Asia.

____ ____ ____ ____

To find the answer, head to the Scandinavian Alpine Tundra, the North Andean Paramo, the Central/Southwest China Temperate Forests, and the Southwest Australian Shrublands and Woodlands.

In many areas of the world, the establishment of one of these can lead to vast amounts of pollution as chemicals and sediments wash into nearby watersheds.

____ ____ ____ ____

To find the answer, look in the North Andean Paramo, the Southern Congo Basin Forests, the Klamath-Siskiyou Coniferous Forests, and the Everglades Flooded Grasslands.

When people do this to wetlands to build houses or create agricultural land, many valuable services the wetlands provide (such as controlling floods and serving as a nursery for sea life) are lost.

____ ____ ____ ____ ____

To find the answer, head to the Klamath-Siskiyou Forests, the Tallgrass Prairies of the United States, the Terai-Duar Savannas and Grasslands, the Mexican Pine-Oak Forests, and the Everglades Flooded Grasslands.

A portion of soil the same size as this object might contain millions of microorganisms, including fungi, bacteria, and tiny animals.

____ ____ ____ ____

To find the answer, look in the Klamath-Siskiyou Coniferous Forests, the Madagascar Dry Forests, the Southern Congo Basin Forests, and the Mexican Pine-Oak Forests.

Bonus Question

This habitat type holds 20 percent of the Earth's plant species, and every ecoregion within it is in critical danger of becoming extinct. What is it?
(The answer uses all the letters highlighted in the Ecoregion Species Cards.)

____ ____ ____ ____ ____ ____ ____ ____ ____

How many ecoregions are there within this habitat type?
Does this habitat type exist in the United States? If so, where?

BEST COPY AVAILABLE

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

X	This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.
	This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").